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ARTICLE

Against Causal Conditions

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Abstract
Many widely discussed historical and contemporary views in epistemology rely on conditions requiring that evidence be causally related to the event that is the subject of belief. Such 'causal conditions' have also appeared both in normative debates about when belief is rational and in metaphysical debates about the relationship between belief and credence. Drawing on this literature, our paper formulates and then carefully scrutinises a range of plausible causal conditions on rational belief. A series of counterexamples leads us to rule out, in turn, distinct attempts to formulate such a condition. We then devise a condition that withstands our test cases. Ironically, though, this condition is ill-suited to play the roles for which causal conditions on rational belief have been theorised in the first place. Our result casts doubt on whether epistemologists should devote further attention to causal conditions, whether on rational belief or on other epistemic states.

Keywords: Epistemology; causal conditions; epistemic justification; credence; metaphysics of belief; blame

1. Introduction

A natural and common idea is that rational beliefs should be based on the right type or types of evidence. Given this observation, claims about the evidential basis for rational belief have been and continue to be central to a range of normative and metaphysical debates. *Normatively*, such claims are central to questions about when belief is justified, as well as questions about whether and when belief licenses certain conduct, such as assigning blame or legal liability. *Metaphysically*, these claims are key in arguments concerning the constituents of knowledge and the distinction between belief and credence. Our paper targets a type of condition that has been proposed as a basis for rational belief: a condition that aims to ground rational belief in an appropriate *causal relationship* between the event that is believed to have occurred and the evidence of that event.

Causal conditions on epistemic statuses appear widely in epistemology, featuring both in important historical theories and persisting in recent work. Alvin Goldman defended a famous causal theory of knowledge on which an appropriate causal connection between belief and the fact in question is required for knowledge.[1] The many

[1]Goldman 1967.

critiques of this view often focused on deficiencies in its ability to rule out certain types of lucky knowledge in rather recherche scenarios (recall 'Fake Barn County'),[2] but, for the most part, did not engage with the plausibility of the causal theory in cases of everyday knowledge. Goldman's causal theory of knowledge still has sympathisers today[3], and it influenced various subsequent theories. Dretske's (1981) and Nelkin's (2000) theories of knowledge are examples, but sensitivity-based views also bear resemblance to Goldman's account.[4] Moreover, positing a causal condition seems a plausible way of making good on the idea, central to the explanationist analysis of knowledge, of believing something *because* it is true.[5] Elsewhere, causal conditions have featured prominently in debates about statistical evidence and legal liability. In a seminal paper, Judith Jarvis Thomson argued that only evidence with an appropriate causal connection to the (putative) fact at issue provides the right sort of 'guarantee' to justify assigning legal liability.[6] Within legal epistemology, one can now find various theories of proof that have clear (and often explicit) genealogical links to Thomson's argument,[7] and adjacent recent work on demographic profiling employs a Thomsonian argument to condemn reliance on racial profiles as unacceptably luck-based.[8]

Among recent work in the metaphysics of epistemology, a widely discussed contribution by Lara Buchak relies on a causal condition to distinguish belief and credence.[9] Buchak claims that belief is irreducible to credence because the two attitudes are sensitive to different types of evidence. Rational belief, Buchak hypothesises, must be based on evidence that is *caused* by the event in question (2014: 294, 308).[10] Credence, on the other hand, is purportedly responsive to any evidence that affects the likelihood of the relevant proposition. Buchak relates this hypothesis to the normative argument that belief – in contrast with credence – plays a necessary role in legitimating interpersonal blame. The apparent role of belief in interpersonal blaming practices has become entrenched in various fields, from epistemology to philosophy of law, political philosophy, philosophy of emotion, and philosophy of mind. Despite the wide uptake of Buchak's conclusion about blame, the subsequent literature has largely overlooked the more specific (yet speculative) hypothesis that underpins it, namely that rational belief (and hence blame) are distinguished by requiring evidence caused by the event in question.

Here, we attempt to render precise and scrutinise the causal condition *on rational belief*. We demonstrate that *prima facie* plausible formulations are problematic – there are routine (counter)examples of rational belief that these formulations do not capture. Moreover, the beliefs in question are entirely respectable bases on which to attribute blame and, arguably, legal liability. This analysis leads us to formulate a condition that withstands our test cases. Ironically, though, this condition is ill-suited to play the role for which a causal condition on rational belief has been theorised in the first place. This

[2]Goldman 1976.

[3]de Grefte and Gebharter 2021, cf. Piccinini 2022. While Piccinini's 'factually grounded belief' account draws on Goldman's causal theory of knowledge, Piccinini argues that a 'causal connection alone is too weak a relation to give rise to knowledge' (409). Piccinini's account of knowledge 'requires that the belief be *grounded in* its truthmaker' (409-410, emphasis in the original) and such grounding entails, but is not exhausted by, a causal connection.

[4]See Becker and Black 2012.

[5]Cf. Bogardus and Perrin 2025, 36-37.

[6]Thomson 1986.

[7]For example, see Enoch, Spectre, and Fisher 2012, Günther 2021. Mortini 2022 discusses how the epistemic and legal literatures relate. Cf. Enoch and Fisher 2015, 567-568.

[8]Lloyd 2021.

[9]Buchak 2014.

[10]Staffel 2016 also reports this view.

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is due to the condition being problematically permissive, unable to rule out beliefs where the justificatory component is only remotely causal. Our critical analysis of causal conditions on rational belief does not – nor aim to – disprove: (i) that there is a metaphysical difference between belief and credence, nor (ii) that belief has a unique functional role, for example, in legitimating blame. But our result casts doubt on whether these popular claims can be defended by relying on a causal condition. We are left in a situation where, once we have circled around a remotely plausible formulation of the causal condition, it seems to fail to play any clear theoretical role – and not the theoretical roles for which causal conditions were first introduced. In fact, unless answered, our result undermines the rationale for much theorising in 'causal epistemology', that is, the whole gamut of theories positing causal conditions on epistemic statuses (be this knowledge, belief, epistemic warrant to blame or to assign legal liability). While our focus is on causal conditions on rational belief, our analysis raises a more general challenge for this entire strand of epistemology. The focus is narrow but, if we are right, the implications of our study are far-reaching.

2. Motivating the causal condition

Causal conditions have often been motivated by the analysis of various contrast cases. Here, we focus on one of the most common pair of cases, now familiar in various literatures. We take Buchak's treatment as a springboard for our analysis.

> **Blue Bus.** A bus negligently injures a pedestrian, but it is unknown which company the bus belongs to. On the route where the accident occurred, the Blue Bus Company runs 80% of the buses. There is no further information available to settle which company the bus belongs to.
> **Green Bus.** A bus negligently injures a pedestrian, but it is unknown which company the bus belongs to. On the route where the accident occurred, the Green Bus Company runs half of the buses. An eyewitness identifies the bus as belonging to the Green Bus Company (the buses are coloured according to the companies' names). It is night-time, and so her vision may have been impaired.

According to Buchak, the evidence in **Green Bus** can support a rational belief in the responsibility of the company, whereas the evidence in **Blue Bus** cannot. At best, the statistical evidence in **Blue Bus** supports a high credence. She hypotheses that this is because, while it can be said of the eyewitness evidence in **Green Bus** that it was *caused* by the fact that a bus operated by this company was responsible for the accident (one can claim that it was the negligent driving of such bus that caused the eyewitness to notice a Green bus and testify accordingly in court), no similar claim can be made about the statistical evidence in **Blue Bus**. Indeed, the statistical evidence in **Blue Bus** exists independently of the accident and may have been compiled before any such accident occurred. This analysis of the two cases leads Buchak to posit a necessary condition for rational belief according to which rational belief requires evidence caused by the event in question. The condition is offered to rationalise the widespread intuition that there is something 'defective' in the evidence in **Blue Bus,** compared to that in **Green Bus**.

To critically assess the condition, we need to be more precise about the required causal connection between event and evidence. While Buchak is terse in this regard, her work suggests two distinct formulations of the causal condition (Buchak 2014: 294).[11]

[11]We refer, in particular, to the first paragraph of page 294 of Buchak's work in which she offers two alternative explanations for her conclusions on the rationality of beliefs involved in scenarios she is discussing.

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We call these **But-for Cause** and **Hypothetical Cause** and assess them first. Ultimately, we reject them in a gradual process of amelioration that leads us to a formulation closer to those offered by Goldman and Thomson in their theories of, respectively, knowledge and legal liability. This formulation is more plausible than the preceding, having withstood our test cases. But its success comes at a price: the formulation is too permissive to play any role of theoretical significance.

3. Formulations and refutations of the causal condition

Consider a first formulation of the causal condition:[12]

> **But-for Cause**: For belief in an event to be rational, the belief must be based on evidence that would not exist but for the event that is believed to have occurred.

A problem is that this formulation generates a *factive* condition: the condition is satisfied if and only if the event actually occurred – that is, the belief in question is true. How so? **But-for Cause** makes the uncontroversial requirement that a rational belief be based on evidence. But the condition also states that the event must have occurred for the belief to be rational. If the event did not occur, and yet we have the evidence and believe on the basis of it, the condition is not satisfied: the evidence does exist without the event occurring.

Notice two problematic consequences of factivity. First, in **Green Bus** we cannot say whether the eyewitness evidence satisfies the condition, since we do not know whether the event in question has indeed occurred; the evidence is needed precisely to acquire such knowledge. But the problem generalises: under a factive condition we can never say whether the available evidence warrants belief until we know that the belief is true; but we cannot know this without relying on the available evidence. The rationality of belief, under this view, would be opaque for all questions about which we lack definitive knowledge. Second, the factive condition problematically denies that false beliefs can be rational. While it is true that some revisionary epistemologies hold that only true beliefs can be rational, these views incur substantial theoretical costs and run contrary to compelling intuitive data points.[13] When all the evidence points in one direction, it is rational to believe accordingly, even in cases where, unbeknownst to everyone, the evidence is misleading. **But-for Cause** may work as a condition for knowledge (insofar as knowledge is factive), but it is, in our view, a non-starter as a condition for rational belief.[14] That being said, we will go on to offer counterexamples to different formulations of the causal condition that *also* apply to **But-for cause.** In this sense, our refutation holds even if one disagrees with us about the problems besetting factive views. But we may as well put our cards on the table now and assert that, in our view, there are already sufficient grounds to discard a factive formulation of the causal condition.

[12]Notice that the formulations we consider pertain to the connection between evidence and event only. Like Buchak and Thomson, and unlike Goldman, we are not concerned with whether belief itself must be caused by the event.

[13]For instance, see Littlejohn (*forthcoming*) or Williamson (*forthcoming*) for attempts to defend these revisionary epistemologies and Brown (2018) for an extended critique.

[14]Similar criticisms of factive views also appear in the literature on legal epistemology: for example, see Blome-Tillmann (2015: section 6), Smith (2018: section 2), and Ross (2020: section 3, Ross 2024: chapter 4).

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Consider a second, non-factive formulation of the causal condition[15]:

Hypothetical Cause: For belief in an event to be rational, the belief must be based on evidence for which it is the case that, if the event occurred, the event provides the most plausible causal explanation for the evidence.

Let's clarify how the condition works with reference to **Green Bus**. Ex hypothesis, we know there was an accident caused by negligent bus driving. The remaining question is: to which company does the offending bus belong? Eyewitness testimony that the offending bus was owned by Green Bus Company is proffered. Notice that **Hypothetical Cause** is not factive: unlike **But-for Cause,** the satisfaction of **Hypothetical Cause** by the testimony does not require that the offending bus was indeed owned by Green Bus Company. Rather, the condition asks us to *hypothesise* that the offending bus was owned by Green Bus Company and consider whether, assuming this event, it provides the most plausible causal explanation for the testimony. If the answer is positive, then the condition is satisfied.

The answer seems positive indeed. We don't know whether the offending bus was owned by Green Bus Company. As far as we know, the testimony may have been caused by something other than the offending bus being owned by Green Bus Company. Perhaps the eyewitness benefits from the financial wellbeing of Yellow Bus Company – she saw a bus owned by Yellow Bus Company, but her wish to protect this company caused her to say 'Green Bus' in court. Perhaps the eyewitness saw a bus owned by Yellow Bus Company, but she suffers from a form of colour blindness that made her perceive yellow as green. And so on. Alternative explanations of the eyewitness evidence, though, become less convincing, if not altogether implausible, once – as required by **Hypothetical Cause** – we hypothesise that the offending bus was indeed owned by Green Bus Company. Under this hypothesis, Green Bus Company's ownership of the offending bus gives us the most plausible causal explanation for the eyewitness evidence. It goes without saying that **Hypothetical Cause** is not satisfied by the statistical evidence in **Blue Bus**: the fact that the offending bus was owned by Blue Bus Company could not possibly cause the evidence. So far, so good: we are able to distinguish the rationality of belief in the classic contrast cases.

Hypothetical Cause, though, must be refined. Consider another variation on **Blue Bus** in which the evidence is that, on the route where the accident occurred, the Blue Bus Company runs *every* bus. To eliminate the possibility that the offending bus is owned by a different company and travelled to the site of the accident from another route, hypothesise that the Blue Bus Company runs every bus in the jurisdiction: no privately owned buses exist in this imagined land and there are no competitor companies. This evidence does not satisfy **Hypothetical Cause** (it would be mystifying to say that such evidence is caused by the event in question), and yet it seems obviously mistaken to deny that the evidence can warrant belief.[16]

This case brings out that the causal condition is a non-starter when it comes to deductive inference. When the truth of premises logically guarantees the conclusion, any further inquiry into the causal relationship between evidence and belief is unnecessary. Belief arrived at through sound deductive inference is rational irrespective of any such causal relationship. Hence, any plausible version of the causal condition must be restricted to ampliative inferences only (i.e., those where the conclusions amplify what we can rationally believe beyond what is contained in the premises), such as induction or abduction.

[15]As with **But-for Cause**, this too is a bona-fide attempt to flesh out Buchak's terse comments on the causal condition.

[16]For a similar point, with reference to criminal conviction, see Enoch and Fisher 2015, 567.

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Consider, then, a third formulation:

> **Hypothetical Cause*:** For ampliative belief in an event to be rational, the belief must be based on evidence for which it is the case that, if the event occurred, the event provides the most plausible causal explanation for the evidence.[17]

Is **Hypothetical Cause*** plausible? We think not. This formulation can be called into question by considering common items of evidence that justify a belief despite not being causally connected to the event in the way required by the condition. Items of this kind include evidence of *motive* and evidence of *past behaviour*. Evidence of motive and past behaviour is routinely accepted in criminal proceedings, a paradigmatic case of rigorous fact-finding.[18]

Consider a criminal case involving evidence of motive and of past behaviour.

> **The Inheritance.** An elderly wealthy person is defenestrated and killed in their mansion. There is no doubt they were murdered. The question is 'by whom?' Alfred had just married the person after a short relationship online and is the person's sole heir. Unbeknownst to this person, Alfred had both large gambling debts and a criminal history. He had spent fifteen years behind bars for another murder, by defenestration, of another elderly wealthy person he had just married.

One seems warranted in believing Alfred responsible for the person's murder – at least, if there is no exculpatory evidence available. But can the causal condition accommodate this conclusion? It cannot, and here is why. As stated, the relevant belief is that Alfred is responsible for the murder. The event in question, then, is Alfred's responsibility for murder. The evidence supporting the belief consists in facts about Alfred's reasons for committing the crime and about his behaviour prior to the crime. There is no other evidence available. Now, there are obviously causal relationships between, on the one hand, motive and past behaviour and, on the other hand, Alfred's responsibility for the murder. But these are not of the kind required by **Hypothetical Cause***. The causal condition requires that Alfred's murderous behaviour be capable of causing his motive and past behaviour. But this is impossible: the motive and past behaviour predate the event.[19] Rather, the motive may have caused the event. With past behaviour the possible causal relationship is more complicated: the same motivational state (e.g., a desire for money) may have caused both past behaviour and Alfred's responsibility for the murder. The bottom line is that the evidence in **The Inheritance** does not satisfy the causal condition and yet, a belief in Alfred's responsibility seems warranted. The point generalises: evidence pertaining to a time prior to the event cannot be causally connected to the event as required by **Hypothetical Cause***, but it may nonetheless warrant belief. Indeed, notice that this causal condition does not allow for rational belief in future events, since in such cases the evidence always predates the event.[20] It is hard to accept this conclusion.

[17]Another less stringent formulation also meets the objections raised so far. Call it **Potential Cause**: for ampliative belief in an event to be rational, the belief must be based on evidence that could have been caused by the event. Our forthcoming objections equally refute this formulation. For a similar condition, see Nelkin 2000, 396-397.

[18]This is true of England and Wales, especially as a result of the Criminal Justice Act 2003.

[19]We assume there is no 'backwards causation' in the cases we discuss.

[20]For a similar challenge to a different explanationist condition on rational belief, see Byerly 2013 and McCain 2014.

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While fatal for Buchak's formulations of the condition, **The Inheritance** does not catch Goldman and Thomson unprepared. Indeed, Goldman (1967, 364–6) and Thomson (1986, 203) acknowledge examples of this kind in their attempt to formulate, respectively, a condition for knowledge (Goldman) and a condition for legal liability (Thomson). Their causal conditions are thus formulated more liberally, in terms of a causal '*connection*' between event and evidence. This allows them to capture cases where the evidence predates the event and cases where the evidence and the event have a common causal antecedent. Perhaps Goldman and Thomson never intended to extend their conditions to rational belief itself, which is the focus of our inquiry. We can nonetheless derive from their discussion another formulation of the causal condition for rational belief:

> **Causal Connection:** For ampliative belief in an event to be rational, the belief must be based on evidence that is plausibly causally connected to the event.[21]

Causal Connection comfortably accommodates **The Inheritance.** The condition is satisfied by *any* plausible causal connection between evidence and event. This includes evidence that predates the event and supports the existence of a prior mental state (e.g., a motive, specifically, desire for money) that plausibly caused the event. **Causal Connection** improves on **Hypothetical Cause*** by countenancing as justificatory any causal explanatory account that plausibly links the event to the evidence.

As promising as **Causal Connection** seems, it also appears to run into trouble in cases of eliminative inference like the following.[22]

> **The Heist.** A valuable jewel is stolen. Only Lynn, Jerry, and Ben could plausibly access the room where the jewel was kept. They each knew it was there. Entry to the room requires a set of biometric checks that it is almost impossible to pass unless one belongs to this group.[23] Lynn and Jerry could not have committed the crime: Lynn was attending a conference on the other side of the globe when the theft occurred, while Jerry was in a coma in hospital. Who is the thief?

One seems warranted in believing that Ben is the thief. This is notwithstanding that the evidence indicating that Lynn and Jerry are not responsible is not plausibly causally connected to the event (i.e., Ben's responsibility).

First impressions notwithstanding, a closer look shows that **The Heist** is not devoid of evidence that satisfies **Causal Connection**. In fact, an explanatory account can be given, according to which Ben was caused to steal the jewel by his knowledge that there was a jewel. If so, the belief that Ben is the thief would seem based on some causal evidence after all: the existence of the jewel is, indeed, evidence of theft, insofar as something that does not exist cannot be stolen. Rather than falsifying **Causal Connection**, then, **The Heist** seems to give the condition further support. But it would be a mistake to rejoice at this result.

[21]Notice that 'plausibly' is needed to avoid the problem of factivity mentioned earlier. The condition cannot require an actual causal connection, lest it is satisfied only if the event is true.

[22]Goldman attempts to accommodate inferences within a causal chain linking event to belief, but his treatment presupposes a causal connection between evidence and event, which is what is in question here (Goldman 1967, 362-363).

[23]Note we say 'almost impossible', otherwise this may be a deductive inference and fall outside the scope of the condition.

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As **The Heist** contributes to show, **Causal Connection** is so permissive a causal condition that virtually any belief can satisfy it.[24] Consider this absurd line of reasoning and the ensuing belief: 'I believe that it will be announced that I won this morning's lottery-draw, because I saw a comet in the sky yesterday'. Now, the event (an announcement that I have won the lottery) and the evidence (a comet hurtling through the night sky) have little to do with each other. But they do have some causal connection – they share causal antecedents. These antecedents include the start of the universe, and the mechanistic laws that determined what phenomena unfolded hence. Under this perspective, every physical event stands in some causal relationship with almost any conceivable item of evidence. This capacious view of a causal connection accommodates cases such as **The Heist** and **Inheritance.** But it comes at the expense of complete triviality. Even bearing in mind that **Causal Connection** is only advanced as a *necessary* condition on rational belief, such a proposed condition has no theoretical value if it is satisfied by pretty much any belief irrespective of how unsupported the belief happens to be. This problem generalises: the theoretical value of **Causal Connection**, once we appreciate how distal such connections can be, is equally nugatory when it comes to discerning the grounds of blame, legal liability, or knowledge. What this problem suggests is that the proponent of a causal condition must continue their search, restricting the nature of **Causal Connection** to exclude such trivial and distant causal links. One attempt, for instance, would be the following:

> **Proximate Causal Connection:** For ampliative belief in an event to be rational, the belief must be based on evidence that plausibly has a *proximate* causal connection to the event.[25]

Proximate Causal Connection seems to emerge from our analysis as a plausible causal condition on rational belief. It satisfies **The Inheritance** and **The Heist**, but it does not fall prey to the 'Big Bang objection' discussed in the previous paragraph. If we stopped here, we would have nonetheless achieved something valuable in ruling out various other causal conditions often flirted with in the literature. Of course, work would still be needed to provide principled guidance on when a causal connection is suitably *proximate* to the event in question. Moreover, this work would need to address questions raised by scenarios, such as **The Heist**, that present a mixed evidence base, with both causal and non-causal evidence.[26] **Proximate Causal Connection** is silent as to whether all evidence on which a rational belief is based must satisfy it. One may argue that only the evidence that satisfies **Proximate Causal Connection** contributes towards the justification of belief. One may, thus, defend a two-pronged approach: not only in the absence of such evidence belief could not be rational but also the evidence that is not causally connected to the event does not render belief any more justified than it would be if only causally connected evidence were present. Now, the second prong is implausible[27] and is flatly contradicted by **The Heist**, where non-causal evidence is surely doing justificatory work. But if we admit that non-causal evidence does such work, how are we

[24]This conclusion chimes with Piccinini's claim that a causal connection is 'too weak a relation to give rise to knowledge' (Piccinini 2022, 409). It also chimes with Heathcote's claim that causal connections 'are far too many … to be useful in an analysis' of knowledge (Heathcote 2014, 386).

[25]On the use of 'plausibly' see n21.

[26]While, due to the 'Big Bang objection' virtually all evidence would be causal under a permissive causal condition such as **Causal Connection**, the same is not true for a condition that requires proximity. Under **Proximate Causal Connection**, **The Heist** surely presents significant non-causal evidence.

[27]Buchak recognises this point at 293.

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to understand the requirement, set in the first prong, that causal evidence be present for a belief to be rational? Would it be plausible, for example, to argue that the justificatory potential of non-causal evidence comes into effect only in the presence of causally connected evidence, as if causal evidence were a justificatory trigger?

These may seem like intriguing questions. At this juncture, though, it is important to take a step back to consider: what would be the point of the intellectual effort in attempting to answer them? More precisely, despite the long pedigree of discussions of causal conditions, we want to sound a note of caution about the fruitfulness of continuing this project.

4. Is there a point in a causal condition on rational belief … or elsewhere?

There are serious doubts that any plausible causal condition can perform the key roles that have motivated the search for such conditions in the first place. Recall that a causal condition is frequently invoked to explain the deficiencies of statistical evidence in cases like **Blue Bus.** This is true of Buchak's condition on rational belief as it is of Thomson's condition on legal liability. It is worth reminding ourselves of this scenario:

> **Blue Bus.** A bus negligently injures a pedestrian, but it is unknown which company the bus belongs to. On the route where the accident occurred, the Blue Bus Company runs 80% of the buses. There is no further information available to settle which company the bus belongs to.

Now, while the statistical evidence in **Blue Bus** does not satisfy **But-for Cause**, **Hypothetical Cause**, or **Hypothetical Cause***, it surely satisfies **Proximate Causal Connection**. How so? Notice that the statistical evidence and the event (i.e., the fact that the bus involved in the accident belongs to the Blue Bus Company) have a common and indeed quite proximate causal antecedent: the Blue Bus Company's purchase of buses. But for such purchase the statistical evidence would not exist; but for such purchase, the offending bus could not be owned by Blue Bus.[28] Unlike the other causal conditions surveyed, **Proximate Causal Connection** resists our attempts at falsification[29], but it does not serve the aim of *explaining* why cases of statistical evidence like **Blue Bus** cannot ground rational belief (or legal liability, for that matter). As far as **Proximate Causal Connection** is concerned, there is nothing deficient in this evidence. What we are left with, then, is a mixed result. On the one hand, and unlike **Causal Connection**, **Proximate Causal Connection** is non-trivial. As such, this condition could be proposed as necessary for rational belief (or knowledge) and for the functional roles that rational beliefs are supposed to play (such as legitimating blame and the assignment of legal liability). On the other hand, **Proximate Causal Connection** does little to nothing to advance our understanding of the contrast cases that have motivated debate in the first place. If a 'proximate causal connection' is considered necessary for rational belief, then the motivation for deeming it such cannot plausibly be found in the answers that this condition delivers in cases of 'naked' statistical evidence; the presence of a 'proximate causal connection' does not distinguish belief from credence, appropriate blame from

[28]Thomson 1986 discusses a nominally different, but substantively similar, hypothetical and, surprisingly, she writes: '[T]he facts available to us neither supply nor suggest anything which might have been a common cause *both* of those facts available to us *and* of the (putative) fact that Red Cab caused the accident' (204).

[29]Note that deeming a positive belief in the **Blue Bus** case to be irrational does not falsify **Proximate Causal Condition**; the condition, like other rival formulations, is intended only as a necessary rather than a sufficient condition on rational belief.

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inappropriate blame, nor lucky true belief from knowledge. Indeed, the explanatory deficiencies of **Proximate Causal Connection** generalise. They resurface in other classic scenarios involving statistical evidence. Consider Jonathan Cohen's hypothetical of the gatecrasher, another staple in the statistical evidence debate:

> **The Gatecrasher:** [I]t is common ground that 499 people paid for admission to a rodeo, and that 1000 are counted on the seats, of whom A is one. Suppose no tickets were issued and there can be no testimony as to whether A paid for admission or climbed over the fence. So [. . .] there is a .501 probability, on the admitted facts, that he did not pay. The mathematicist theory would apparently imply that in such circumstances the rodeo organisers are entitled to judgement against A for the admission money, since the balance of probability would lie in their favour. But it seems manifestly unjust that A should lose his case when there is an agreed mathematical probability of as high as .499 that he in fact paid for admission. (Cohen 1977: 75).

Now, believing in A's responsibility for gatecrashing seems unwarranted – after all, the probability that A is among the gatecrashers is just above .5. But this result is a function of the numbers in the scenario, picked by Cohen to produce a startling argument against the probabilistic understanding of legal standards of proof. The numbers can be tweaked and the probability that A gatecrashed can be suitably increased so as to provide further support for a belief in this event. The question remains whether, given that the evidence is statistical, such a belief could ever be warranted. A parallel question concerns the warrant for the distinct conclusion that A is legally liable. Many have the intuition that both questions should be answered negatively – neither belief in, nor legal liability for, A's gatecrashing would be warranted. The point here is that **Proximate Causal Connection** cannot explain this intuition. It is indeed easy to identify a proximate causal antecedent that is plausibly shared by the hypothesised event (A's gatecrashing) and the statistical evidence: the fact that a rodeo had been planned in that venue is a suitable candidate. It does not take much work to see that the issue ramifies and similar considerations apply to other paradigmatic cases of statistical evidence.

If appeal to causal conditions cannot disqualify beliefs that are largely supported by statistical evidence, there is a real question about what role such theorising has in epistemology. It cannot be the metaphysical task of distinguishing belief from credence, since, as we have observed, paradigm cases that are supposed to generate a 'mere' credence rather than a full-blooded belief seem to satisfy the most plausible causal condition yielded by our investigation. And the failure to rule out cases in which a belief is supported mainly by statistical evidence also calls into question other theoretical roles that one might expect 'causal theorising' to play. One of these is to exclude cases of epistemically lucky true belief. As pointed out in the Introduction, some of the earliest discussions of causal conditions aimed to employ them as necessary conditions for epistemic statuses such as knowledge. This was done on the assumption that causal conditions could be used to exclude from the constituents of knowledge beliefs that are true due to mere luck.[30] This ambition has been repeated in recent work.[31] Yet, it is unclear that causal conditions can play this role if they are unable to preclude beliefs that are largely supported by statistical evidence. A common objection to beliefs of this kind is that they fail to be candidates for knowledge, precisely due to the fact that there is a substantial degree of luck in getting things right by relying on probabilities

[30]For example, Goldman 1967/1976, who we discussed above.

[31]See de Greft and Gebharter 2021.

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alone – lottery beliefs, for instance, are often considered as 'paradigmatic' examples of beliefs subject to epistemic luck.[32] Our analysis has shown that a causal condition may not rule out knowledge when beliefs based on statistical evidence are involved.

Adopting an even wider theoretical lens, one might have thought that causal theorising could form part of a more general anti-Bayesian perspective in epistemology. Bayesians generally see little need for the types of conditions proposed by those 'traditional' epistemologists who prefer to work with categorical states (like belief) rather than graded credences. Causal conditions, if they could be shown to have some theoretical utility, could have been a beachhead for traditional epistemology to explain the indispensable role of non-Bayesian conditions on the rationality of belief – and demonstrate why a purely Bayesian perspective that deals only in credences is impoverished. However, an upshot of this paper is that it is unclear that any plausible version of a causal condition on rational belief can play a role of any such significance.

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[32]Indeed, this 'paradigmatic' label is precisely that used by Duncan Pritchard 2015 in a paper extending the diagnosis that Gettier cases block knowledge due to the presence of luck to the knowledge-blocking effect of non-Gettier instances of epistemic luck.

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